

CLAIMS

1. A variable focus lens (2; 26) for an eye comprising a transparent rear wall (8; 28), a transparent front wall (6; 106), a cavity (14; 114) formed between the transparent front wall and the transparent rear wall, first and second immiscible fluids (16, 17) of differing refractive index contained within said cavity, and electrodes (18, 21) to which a voltage is able to be applied to change the curvature of a fluid meniscus (4; 104) between the two fluids, wherein at least the rear wall of the lens includes a biocompatible material, which material provides for biocompatibility of the lens with the eye.

2. A variable focus lens according to claim 1, wherein at least one of the front wall and rear wall have a curved surface (10, 12; 30).

15 3. A variable focus lens according to claim 2, wherein the front wall and the rear wall are convex.

4. A variable focus lens according to any preceding claim, wherein the front wall includes a biocompatible material, which material provides for biocompatibility of the lens with the eye, and the lens (26) is adapted for implantation in a human eye.

5. A variable focus lens according to claim 2, wherein the front wall is convex and the rear wall is concave.

25 6. A variable focus lens according to claim 5, wherein the lens is in the form of a contact lens (2) for placement on an exterior surface of a human eye.

30 7. A variable focus lens according to any preceding claim, wherein the fluid meniscus has a contact angle (β) with one of the front and rear walls, the contact angle determining the curvature of the fluid meniscus, and wherein

at least a first of the electrodes (18) is positioned in the lens to enable variation of the contact angle between the fluid meniscus and the wall through controlled application of the voltage, thereby altering the curvature of the fluid meniscus.

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8. A variable focus lens according to claim 7, wherein the first electrode is positioned in or in proximity to the wall with which the fluid meniscus has a contact angle.

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9. A variable focus lens according to claim 7 or 8, wherein the first electrode is annular and is placed to extend around the periphery of an inner surface of the wall with which the fluid meniscus has a contact angle.

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10. A variable focus lens according to any one of claims 7 to 9, wherein the first electrode is placed on the front wall.

11. A variable focus lens according to any preceding claim, wherein the distance between the front wall and rear wall is greater than 50 microns.

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12. A variable focus lens according to any preceding claim, wherein the distance between the front wall and rear wall is such that an optical power of the lens can be varied between 0 and 50 dioptres by altering the curvature of the fluid meniscus.

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13. A variable focus lens according to any of claims 1 to 11, wherein the distance between the front wall and rear wall is such that an optical power of the lens can be varied between -25 and +25 dioptres by altering the curvature of the fluid meniscus.

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14. A variable focus lens according to any preceding claim, wherein a periphery of the front wall joins a periphery of the rear wall to form an acute internal angle (α) at their joining region (J).

15. A variable focus lens according to any preceding claim, wherein the first and second fluids are of substantially identical specific gravity.

5 16. A variable focus lens according to any preceding claim, wherein at least one of the first fluid and the second fluid includes a biocompatible material, which material provides for biocompatibility of the lens with the eye.

10 17. A variable focus lens according to any preceding claim, wherein the first and second fluids are oil and an electrolyte respectively.

15 18. A variable focus lens according to claim 17, wherein the oil is disposed in the cavity between the electrolyte and the front transparent wall, and the electrolyte is disposed in the cavity between the oil and the rear transparent wall.

19. A variable focus lens according to claim 17, wherein the electrolyte is disposed in the cavity between the oil and the front transparent wall, and the oil is disposed in the cavity between the electrolyte and the rear transparent wall.

20. A variable focus lens according to claim 17, 18 or 19, wherein the electrolyte comprises a water/salt mixture.

25 21. A variable focus lens according to any preceding claim, wherein the first fluid is less conductive than the second fluid.

30 22. A variable focus lens according to any preceding claim, wherein the biocompatible material is polymethylmethacrylate (PMMA), a hydrogel polymer, hydroxyethylmethacrylate (HEMA), silicone rubber, a cyclic olefin copolymer (COC), or glass.

23. A variable focus lens according to any preceding claim, wherein the curvature of the fluid meniscus is varied by applying the voltage to the electrodes via one of:

- capacitive coupling,
- 5 inductive coupling, or
- optical coupling.